Abstract No. huq420

Mineralogical Analysis of Punic Make-up

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Beamline(s): X3B1

Introduction: Natural antique colorants include red pigments such as cinnabar and ochre and pink pigments such as madder. These archaeological pigments have been used as ritual and cosmetic make-up and they are a material proof of handcraft activities and trade in the Mediterranean. The pigments were discovered during different excavations in archaeological sites of Tunisia (Carthage, Kerkouane, Bekalta, Bouaarada and elsewhere). There is little material evidence on the Carthagenian society and their civilization compared to other contemporary cultures in the Mediterranean. In this respect scientific examination of material from Punic sites is of particular interest to archaeologists.

Methods and Materials: Ten punic make-up samples were studied with high angular resolution powder diffraction and SR-XRD using a 2D CDD detector. Elemental analysis was also carried out using Atomic Emission Spectroscopy (AES).

Results: Four of the samples are characterized by diffraction patterns that are almost exclusively composed of cinnabar and quartz reflections. Rietveld fitting of the profiles gives a relative weight abundance between cinnabar and quartz from 12:88 to 75:25 percent with no significant amounts of other mineral phases to be included in the fitting. There are hardly any reflections that cannot be indexed as cinnabar or quartz. The corresponding 2D pattern shows that the cinnabar diffraction rings are fine and continuous indicating particles of small size while the quartz rings contain more distinct diffraction spots indicating the presence of sizeable crystallites of preferred orientation. Four other samples, as expected from the AES analysis contain hematite as well as quartz, at a ratio of 75:25 to 35:65 percent weight. In two cases significant amounts of calcite are identified. Other reflections are also present between 3.4 and 5.5A, most likely minerals present in the source material from which hematite was extracted. The other two pink-colored samples, exhibit profiles that are weakly diffracting compared to the other pigments. Quartz is present but at much lower levels. The remaining minerals could not be satisfactorily identified despite the much higher sensitivity and resolution of the synchrotron technique. Organic pigments such as purpurin and alizarin found in other such pigments in previous studies were not observed. However a relatively large background was present indicating the presence of non crystalline material.

Conclusions: These results are similar to what would be obtained from raw materials indicating that eight of these samples were not subject to any preparation by the Carthaginians. These eight samples were used as ritual make-up. However, the last two pink colorants (FCC2 and C41C) showed an amorphous background, their preparation required sophisticated techniques corresponding to cosmetic make-up.

Figure 1: Punic cosmetic and ritual make-up.

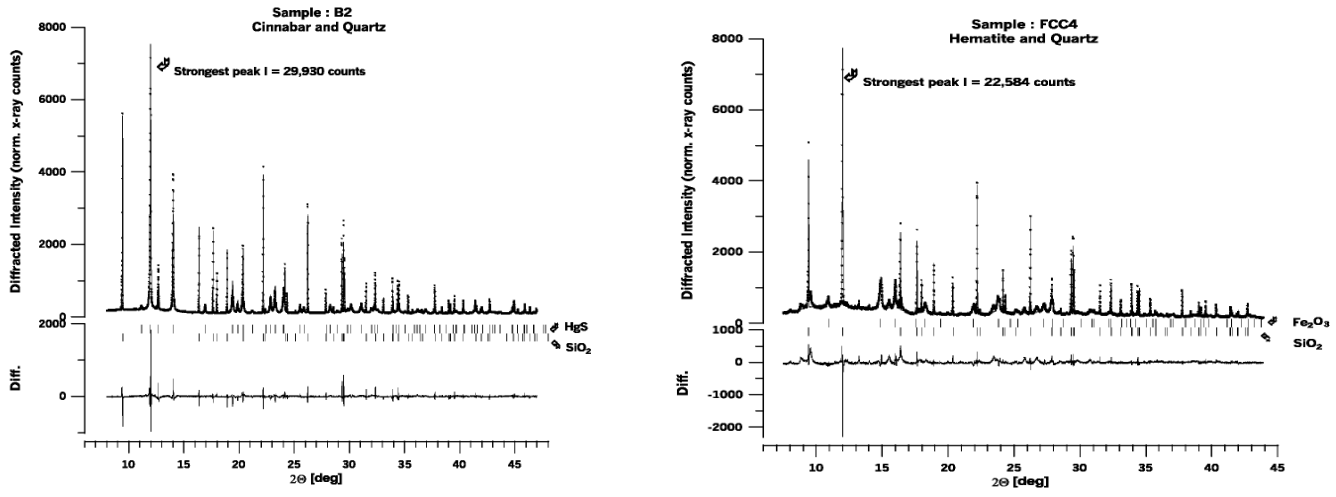

Figure 2: Powder patterns of two ritual make-ups and best Rietveld fit obtained with identified minerals.